THE FULLERENES FROM THE VIEWPOINT OF THIRTEEN YEARS

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It has been almost thirteen years since the discovery of buckminsterfullerene and the fullerene family of carbon cage compounds and almost eight years since Krätschmer, Lamb, Fostiropoulos, and Huffman put these molecules into the hands of scientists around the world. Fullerene research, which began in late 1990 as a feeding frenzy, is evolving into a maturing field, and the fullerenes have become accepted as a kind of material without mystic powers, but still of great interest to chemists, applied physicists, materials scientists, and biologists. Some of the high points of this history will be reviewed and some current directions of ongoing research in the field will be discussed.

High Resolution Spectroscopy with a Tunable Sideband Spectrometer

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Using electro-optic CdTe crystals excited with microwave sources, it is possible to modulate the amplitude of the radiation delivered by a CO_2 laser. Sidebands are then created that can be made widely tunable and that possess a high spectral purity. We have developed a saturation subdoppler spectrometer taking advantage of such a source that covers about half of the emission range of the laser and therefore allows to investigate the saturation spectrum of numerous molecules absorbing in the 10 μm range. Typical resolution is 100 kHz. Absolute frequency measurements are accurate to about 10 kHz. They are provided by the frequency locking of the CO_2 laser on a saturation resonance of CO_2 observed in absorption in a reference cell. Saturation spectra of C_2H_4, OCS, CDF_3, SF_6, NH_3 and N_2H_4 have been studied with the set-up. In the case of SF_6, the $2\nu_3 - \nu_3$ hot band has been studied using a subdoppler double resonance scheme with two independent electro-optic modulations to generate the pump and probe radiations. As a result, accurate knowledge of the $2\nu_3$ state has been obtained that has permitted the observation of strong doppler-free two photon transitions of SF_6 towards this $2\nu_3$ state with the sideband spectrometer.